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DISPOSITIF CONNECTEUR

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Description

FIELD OF THE INVENTION

[0001] This invention is directed generally to breast pump assemblies and, more particularly, to an improved adapter for use within a breast pump assembly.

BACKGROUND OF THE INVENTION

[0002] Breast pump assemblies for extracting or expressing breast milk from a woman's breasts for later use to feed by an infant, have been available for years. Typically, these breast pump assemblies include a source of reduced pressure or vacuum, and at least one milking unit, which includes a funnel-shaped hood, or breast shield, and a storage container. The breast shield is placed over the woman's nipple and a substantial portion of the breast. A reduced pressure or vacuum is intermittently generated in the breast shield in a manner that causes milk to be expressed from the breast. The milk then typically flows to the storage container for later use. Although vacuum is what is typically employed in the operation of a breast pump assembly, positive pressure may also be conveyed in desired applications.

[0003] Generally, two types of breast pump assemblies have been marketed for use by nursing women: manually operated breast pump assemblies; and motor-driven breast pump assemblies. In manually operated breast pump assemblies, the intermittent vacuum is typically generated by means of a piston type pump. The piston pump generally includes a piston cylinder, which is connected to the breast shield, and a piston, slidably disposed within the piston cylinder. The piston has a hand-drivable piston rod connected thereto by which a person operating the breast pump assembly can manually move the piston back and forth within the piston cylinder, thus generating the vacuum. The intermittent vacuum in motor-driven breast pump assemblies is typically generated by a similar piston pump, but the piston pump is connected to an electrically powered motor drive unit, and the motor drive unit moves the piston back and forth within the piston cylinder. There is a breast pump assembly sold by Medela, Inc. under the mark LACTINA®, which has a motor drive unit adapted for operating a piston pump which could otherwise be used for a manually operated breast pump assembly. An example of this manual, yet also motorized breast pump assembly is disclosed in U.S. Patent No. 5,007,899 ("the '899 patent"). The motor drive unit is separate from the breast shield. The vacuum generated when the motor drive unit moves the piston back and forth within the piston cylinder is transmitted to the breast shield through plastic tubing, which is connected to both the breast shield and the piston pump. The plastic tubing is often connected to the piston pump and/or the breast shield by use of an adapter. Because of the transfer of air throughout the breast pump assembly, the adapter must provide an airtight

seal. Additionally, the user should be able to easily manipulate the adapter.

[0004] In the type of breast pump assembly disclosed in the '899 patent, where the breast shield can be used in a manual or a motorized mode, the breast shields and their pumps must be precisely matched in order to provide a safe and efficiently operating unit. The piston pumps used with the '899 patent breast pump assembly re, for example, precisely tuned to the operational function of the breast shield used therewith as, for instance, concerning the volume of air moved in the cyclical action of the pump. Use of a different pump or breast shield can adversely affect the use of the subject breast pump assembly.

[0005] Accordingly, there is a demand for an adapter that provides a means for precisely matching breast shields and corresponding pumps. The present invention satisfies this demand.

[0006] US 5,601,531 discloses a male coupling component with a sealing portion between a first and a second end, the sealing portion having a generally triangular cross-section.

SUMMARY OF THE INVENTION

[0007] It is an object of the present invention to provide an improved adapter for use in a breast pump assembly that not only provides an airtight seal, but also serves as a means to prevent connection of unmatched and potentially deleterious components.

[0008] The present invention provides an adapter according to claim 1 for use in connecting a motor driven piston pump - that is, a fluid pressure or vacuum source - with a breast pump assembly. The adapter comprises in part a cap portion, which sealingly engages a piston cylinder of the piston pump. The cap portion defines, in part, a vacuum chamber therein which communicates with the interior of the piston cylinder and a lower well of the female coupling component, described in more detail hereinafter.

[0009] The adapter further comprises a male coupling component including a longitudinal axis having a first end and a second end. The male coupling component can be removably or fixedly attached at its first end to a tube for conveying the fluid pressure from the fluid pressure source. A passageway extends between the first end and the second end for further conveying the fluid pressure. A radially outwardly extending sealing portion is formed on an exterior surface of the male coupling component spaced from the second end.

[0010] The adapter further comprises a female coupling component sized and shaped for receiving the male coupling component. The female coupling component includes upper surfaces and lower surfaces, and a rim surface. The upper surface and the lower surface are sized and shaped such that the female coupling component can receive the male coupling component therein.

[0011] The upper surface of the female coupling com-

ponent defines an upper well having a first general diameter. The upper well is sized and shaped to match the size and shape of the radially outwardly extending sealing portion. When the male coupling component is received in the female coupling component, the sealing portion of the male coupling component is received in the upper well. Because the upper well matches the size and shape of the radially outwardly extending sealing portion, when the sealing portion of the male coupling component is received in the upper well, the upper surface engages a sealing surface of the sealing portion to form an airtight seal.

[0012] The lower surface of the female coupling component defines a lower well with a second general diameter, which is less than the first general diameter of the upper well. The lower well is sized and shaped to receive the second end of the male coupling component therein. The lower well is connected to the upper well by a rim surface. A channel is formed in the lower surface of the female coupling component. The channel includes an opening in the rim surface and is open at least at one point along the lower surface. The lower surface also includes a port therein which allows communication between the lower well and the vacuum chamber.

[0013] When the upper surface and the sealing surface of the sealing portion are sealingly engaged, ambient air is prevented from being drawn into the female coupling component, thereby permitting the pump to work at its optimal operating vacuum. When an unmatched male coupling component is used, ambient air is drawn into the upper well and is transmitted into the lower well through the channel, and then through the port, into the vacuum chamber, thus preventing the breast pump assembly from working at its optimal operating vacuum. Therefore, use of unmatched components can be potentially harmful.

[0014] These and other features and advantages of the present invention will be further understood upon consideration of the following detailed description of an embodiment of the present invention, taken in conjunction with the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

FIG. 1 is a perspective view showing a preferred embodiment of a breast pump assembly of the kind incorporating the present invention;

FIG. 2 is a perspective view of an adapter, in accordance with the present invention;

FIG. 3A is an overhead view of the adapter of **FIG. 2**;

FIG. 3B is a perspective view of a second embodiment of an adapter;

FIG. 4 is another perspective view of the adapter of **FIG. 2**;

FIG. 5 a cross-sectional view of the adapter of **FIG. 2**;

FIG. 6A is an overhead perspective of one embod-

iment of a female coupling component, used in an adapter in accordance with the present invention;

FIG. 6B is an overhead perspective of a second embodiment of a female coupling component, used in an adapter in accordance with the present invention;

FIG. 7 is another overhead perspective of a female coupling component, used in an adapter in accordance with the present invention, showing a connector entering the coupling component;

FIG. 8 is a perspective view of a pair of male coupling components, as used in an adapter of the present invention;

FIG. 9 is a cross-sectional view of the male coupling components of **FIG. 8**;

FIG. 10 is a perspective view of another pair of male coupling component, as used in an adapter of the present invention;

FIG. 11 is a cross-sectional view of the male coupling components of **FIG. 10**;

FIG. 12 is a perspective view of another male coupling component, as used in an adapter of the present invention;

FIG. 13 is a cross-sectional view of the male coupling components of **FIG. 12**; and

FIG. 14A is a perspective view of a stopper as used in an adapter of the present invention;

FIG. 14B is a perspective view of a stopper as used in an adapter of the present invention;

FIG. 14C is a perspective view of a stopper as used in an adapter of the present invention; and

FIG. 14D is a perspective view of a stopper as used in an adapter of the present invention.

DETAILED DESCRIPTION OF INVENTION

[0016] **FIG. 1** illustrates, generally, the usage of one embodiment of the present invention within a breast pump assembly. One embodiment of a breast pump assembly **20** is shown in **FIG. 1**, and includes two milking units **22** and a motor drive unit **24**. Each milking unit **22** includes a breast shield **26** and a container **28**, such as a bottle, for collecting and storing the breast milk, which is connected to the lower portion of the breast shield **26**. The milking units **22** are adapted to be used with a piston pump **30**. A piston cylinder **32** of the piston pump **30** is connectable to the breast shield **26** to operate the milking unit **22** in a manually driven mode (i.e., the piston pump is reciprocated by hand). The piston cylinder **32** can be connected to the breast shield **26** directly, or by way of tubes **44** which can be attached to a tube attaching means (not shown) on the breast shield **26**. Details of this type of breast pump assembly and the piston pump can be gleaned from U.S. Pat. Nos. 4,929,229 and 4,857,051.

[0017] The motor drive unit **24** is also adapted to receive and hold and to mechanically operate the piston pump **30**. The motor drive unit **24** is substantially as shown and described in U.S. Pat. No. 5,007,899.

[0018] An improved cylinder holder, or adapter 34 of the present invention is attachable to the casing 36 of the motor drive unit 24. The piston cylinder 32 is received in the adapter 34. A piston 33, having a piston rod 38 extending therefrom, is slidably disposed within the piston cylinder 32 and the piston rod 38 is releasably held at one end of an arm 40. Arm 40 is mounted at its other end to the casing 36 of the motor drive unit 24 for reciprocal movement of the piston rod 38. As will be described in detail below, the adapter 34 includes female coupling components 42 (See FIG. 3A and 3B) for removably connecting tubes 44 to the breast shields 26 of the respective milking units 22, via male coupling components 50 (See FIG. 2).

[0019] In brief, the motor drive unit 24 reciprocally moves the piston rod 38, thus moving the piston 33 back and forth within the piston cylinder 32. A rearward stroke of the piston rod 38 and thereby piston 33, that is, such that the piston 33 is moved to a position where it is partially exposed from the cylinder 32, generates a pressure change (usually a negative pressure) that is transmitted through the adapter 34 and the tubes 44 to one or both of the milking units 22.

[0020] As seen in FIGS. 2-5, the adapter 34 of the present invention includes a cap portion 46 that is match-threaded at 48 for substantially airtight attachment to the piston cylinder 32. FIG. 5 shows that the inside of the cap portion 46 of one embodiment of the invention includes a seal ring 47 disposed therein for sealing engagement with the piston cylinder 32. The cap portion 46, defines in part, a vacuum chamber 52 that communicates with the interior of the piston cylinder 32 and, through ports 54 with the interior of the female coupling components 42.

[0021] Further, the adapter 34 includes a post 56 that is removably received within a post hole (not shown) in the casing 36 to mount the adapter 34 to the motor drive unit 24. FIGS. 3A, 3B, and 4 show that the exterior side-wall 46A of the cap portion 46 includes a flange 51. The flange 51 slides into an enlarged slot (also not shown) when the post 56 is inserted in the post hole and the adapter 34 rotated into place (in a similar manner as described in the '899 patent). Other means for mounting the adapter to the casing can be readily employed, of course.

[0022] As shown in FIGS. 2, 3A, and 3B, adapter 34 generally includes female coupling components 42. The female coupling components 42 are sized and shaped to snugly receive mating male coupling components 50 (discussed in further detail below and shown in FIGS. 8-13), which are removably or fixedly attached to the ends of the tubes 44. This arrangement serves to provide an easily manipulated secure connection of the tubes 44 to the ports 54 in the female coupling components 42. For brevity, discussion will center on a single female coupling component 42, but it is understood that the coupling components 42 contain identical elements.

[0023] Referring to FIGS. 3A, 3B, and 5-8, the female

coupling component 42 includes an upper surface 68, a lower surface 70, a bottom surface 72, and a rim surface 74. The upper surface 68 is sized and shaped to define an upper well 66 therein (FIG. 5). The lower surface 70 is sized and shaped to define a lower well 67 therein (FIG. 5). The lower surface 70 has a port 54 therein, through which air, or any fluid, can pass from the lower well 67 to the vacuum chamber 52, or vice versa. A channel 76 is formed in the lower surface 70 and is in communication with the port 54.

[0024] The upper well 66 has a diameter D1. The lower well 67 has a diameter D2. Diameter D1 is greater than diameter D2. The upper well 66 is connected to the lower well 67 by the rim surface 74. The channel 76 extends from an opening 78 in the rim surface 74 to the bottom surface 72 and is open to the lower well 67 at one or more points along the lower surface 70.

[0025] FIGS. 6A and 6B illustrate overhead detailed schematics of two embodiments of a female coupling component 42. The bottom surface 72 of the lower well 67 has at least one radially extending groove 80 formed therein. The groove 80 is in fluid communication with the channel 76 formed in the lower surface 70 and is open to the lower well 67 at one or more points along the bottom surface 72.

[0026] The upper well 66 is sized and shaped to receive and thereby provide a snug fit with the male coupling component 50. As depicted in one embodiment, the upper well 66 comprises a generally polygonal or slightly rounded triangular shape. It is understood however, that the upper well 66 can be of any shape provided it is sized to match a sealing portion 88 of a male coupling component 50 as will be described in further detail hereinafter.

[0027] Referring again to FIGS. 3A and 3B, adapter 34 also includes a stopper mount 58A, 58B and a stopper rest 60. Additionally, the stopper mount 58A further includes an aperture surface 62A, 62B that defines an aperture 64. As shown in FIG. 3A, the aperture surface 62A may extend outward from the adapter 34 such that stopper mount 58A is sized and shaped as an elevated cylinder. Alternatively, as shown in FIG. 3B, aperture surface 62B may extend inward into the adapter 34 such that stopper mount 58B is a well within the adapter 34. Stopper mount 58A, 58B receives a mounting end 98A, 98B of stopper 96A, 96B (see FIGS. 14A, 14B, 14C and 14D) thereon, to mount the stopper 96A, 96B on the adapter 34.

[0028] The stopper 96A, 96B is shown generally in FIGS. 14A, 14B, 14C and 14D. Plug 100A, 100B of stopper 96A, 96B may be placed, when not in use as a stopper, in the stopper rest 60. Preferably, stopper 96A, 96B is used to "cut off" one of multiple female coupling components 42 in the event that the user wishes to only utilize one of the milking units 22. Additionally, stopper 96A, 96B may include gripping ridges 102 on a top surface 101 as depicted in FIG. 14C. Further, when employed in single pumping, wherein the plug 100B is fitted to one of the female parts 42, a predetermined amount of leakage

may be provided by orifice **104** (**FIG. 14C**) or in the alternate, an outer aperture or groove **106** (**FIG. 14D**). It will be understood that the orifice **104**, or in the alternate groove or aperture **106**, functions to permit fluid (air) venting between atmosphere and the interior of the female portion **42**. In addition as discussed in more detail herein, plug **100B** may be any suitable complementary shape with wall **68**, and is preferably the depicted polygonal shape including gently convex outer walls.

[0029] As shown in **FIG. 2**, stopper rest **60** is similar in shape and size, to the wall **68** of upper well **66**. The purpose for this is that the plug **100A**, **100B** of the stopper **96A**, **96B** is shaped similarly to a sealing portion **88** (see **FIG. 8**) to snugly fit into the stopper rest **60** (when not in use), and the upper well **66** of the female coupling component **42** (when in use).

[0030] As discussed earlier, tubes **44** are attached to male coupling components **50**, which in turn may be inserted into corresponding female coupling components **42**. This arrangement serves to provide an easily manipulatable and secure connection of tubes **44**, via male coupling components **50**, to adapter **34**.

[0031] **FIGS. 8-9** illustrate various perspectives of one embodiment of a male coupling component **50**. As shown in detail in **FIG. 8**, male coupling component **50** is shown with a first end **82** to which a tube **44** is attached, and a second end **84**. A passageway **86** extends through the male coupling component **50** between the first end **82** and the second end **84** for conveying the fluid pressure. Additionally, the connector **50** includes a radially outwardly extending sealing portion **88** formed on the male coupling component **50** between the first end **82** and the second end **84** and spaced from the second end **84**. As shown in **FIG. 8**, the sealing portion **88** can be of a generally polygonal or slightly rounded triangular shape. It is understood, however, that the sealing portion **88** can be of any shape, so long as it matches the shape of the upper well **66** of the female coupling component **42**. The sealing portion **88** also has a sealing surface **90** that includes at least one circumferential sealing ring **92** thereon, which engages the upper surface **68** of the upper well **66** to form a substantially airtight seal such that ambient air is prevented from entering the female coupling component **42**. The upper surface **68** may include at least one circumferential groove (not shown) therein that engages with the circumferential sealing ring **92** to form the substantially airtight seal.

[0032] **FIGS. 10-11** illustrate various perspectives of another embodiment of a male coupling component **150**. As shown in detail in **FIG. 10**, male coupling component **150** is shown with a first end **182** to which a vacuum tube **44** is attached, and a second end **184**. A gripping portion **194** surrounds the first end **182**. **FIGS. 10 & 11** show that the gripping portion **194** has a slightly concaved exterior surface **196** and a cylindrical interior surface **198** with a diameter **D3** greater than diameter **D4** of the first end **182** such that a tube **44** can be attached to the first end **182**, yet snugly received within the interior surface

198 of the gripping portion **194**. A passageway **186** extends through the male coupling component **150** between the first end **182** and the second end **184** for conveying the fluid pressure. Additionally, the male coupling component **150** includes a radially outwardly extending sealing portion **188** formed on the male coupling component **150** between the first end **182** and the second end **184**, spaced from the second end **184**. The sealing portion **188** can be of any shape so long as it is sized and shaped to match the size and shape of the upper well **66** of the female coupling component **42**, but is depicted as having a generally polygonal or slightly rounded triangular shape. The sealing portion **188** has a sealing surface **190** that includes at least one circumferential sealing ring **192** thereon, which engages the upper surface **68** of the upper well **66** to form a substantially airtight seal such that ambient air is prevented from entering the female coupling component **42**. The upper surface **68** may include at least one circumferential groove (not shown) therein that engages with the circumferential sealing ring **192** to form the substantially airtight seal.

[0033] **FIGS. 12-13** illustrate various perspectives of yet another embodiment of a male coupling component **250**. As shown in detail in **FIG. 12**, male coupling component **250** is shown with a first end **282** to which a tube **44** is attached, and a second end **284**. A passageway **286** extends through the male coupling component **250** between the first end **282** and the second end **284** for conveying the fluid pressure. Additionally, the connector **250** includes a radially outwardly extending sealing portion **288** formed on the male coupling component **250** between the first end **282** and the second end **284**, spaced from the second end **284**. The sealing portion **288** can be of any shape, so long as it is sized and shaped to match the size and shape of the upper well **66** of the female coupling component **42**, but is depicted as having a generally circular shape. The sealing portion **288** has a sealing surface **290** that engages the upper surface **68** of the upper well **66** to form a substantially airtight seal such that ambient air is prevented from entering the coupling component **42**.

[0034] As a result of the unique design of the male coupling components **50** and the female coupling components **42**, described above, the present invention provides for a unique fit between the male coupling components **50** and the female coupling components **42**. This unique design assures that only this coupling component and connector will be successfully mated, thereby assuring that only properly matched equipment will be used.

[0035] It should be appreciated that the embodiments described above are to be considered in all respects only illustrative and not restrictive. The scope of the invention is indicated by the following claims rather than by the foregoing description. All changes that come within the meaning and range of equivalents are to be embraced within their scope.

Claims

1. An adapter (34) for connecting a vacuum source (30) to a breast shield (26) with tubing (44) comprising: a housing (46) attachable to the vacuum source (30) including an internal chamber (52) in communication with the vacuum source (30); one or more female coupling components (42), each of said one or more female coupling components (42) defined by an interior sidewall surface (68) or said housing (46), said interior sidewall surface including an upper portion (66) with a first sidewall diameter (D1) and a lower portion (67) with a second sidewall diameter (D2), and a rim portion (74) between said upper portion (66) and said lower portion (67) connecting said upper portion (66) and said lower portion (67), said second sidewall diameter (D2) being less than said first sidewall diameter (D1), said lower portion (67) including one or more port (54) formed therein allowing communication of said female coupling component (42) with said internal chamber (52), and one or more channels (76) formed therein communicating with an opening (78) in said rim portion (74), and one or more male coupling components (50), each of said one or more male coupling components (50) including a first end (82), a second end (84) and a passageway (86) extending between said first end (82) and said second end (84) said first end (82) being sized and shaped to be attached to the tubing (44), said second end (84) being sized and shaped to be received in one of said one or more female coupling components (42) and having a first end diameter, each of said one or more male coupling components (50) further including a sealing portion (88) between said first end (82) and said second end (84), said sealing portion (88) having a sealing surface (90) formed about a periphery thereof, said sealing portion (88) having a second end diameter, said second end diameter being greater than said first end diameter, said sealing portion (88) being sized and shaped to be received in said upper portion (66) of said female coupling component (42) such that said connector sealing surface (90) is in a substantially airtight engagement with said interior sidewall surface (68).
2. The adapter of claim 1 wherein said channel (76) is formed axially along said lower portion (67).
3. The adapter of claim 1 wherein said one or more female coupling components (42) is further defined by a bottom surface (72) of said housing (36).
4. The adapter of claim 3 wherein said bottom surface (72) includes one or more grooves (80) formed therein communicating with said one or more channels (76).
5. The adapter of claim 3 wherein said lower portion (67) includes three of said one or more channels (76) formed axially in said lower portion (67) of said interior sidewall surface (68) said three channels (76) being evenly spaced about said periphery of said lower portion (67) of said interior surface (68), and said bottom surface (72) includes three grooves (80) formed radially therein, said grooves (80) in said bottom surface (72) being in respective communication with said one or more channels (76) in said lower portion (67) of said interior sidewall surface (68).
6. The adapter of claim 1 wherein two of said one or more female coupling components (42) are provided thereon, and two of said one or more male coupling components (50) are provided to be received in said female coupling components (42), and further including a stopper (96A, 96B), said stopper (96A, 96B) being sized and shaped to sealably engage said upper portion (66) of either of said two female coupling components (42).
7. The adapter of claim 6 wherein said stopper (96A, 96B) includes an aperture (104, 106) formed therein such that when said stopper (96A, 96B) is engaged with said female coupling component (42), said aperture (104, 106) extends between ambient atmosphere and said female coupling component (42).
8. The adapter of claim 7 wherein said aperture (104, 106) is formed along an outside wall of a plug portion of said stopper (96A, 96B).
9. The adapter of claim 7 wherein said aperture (104, 106) is formed through said stopper (96A, 96B) so as to permit air leakage between ambient atmosphere and said female coupling component (42) when said stopper (96A, 96B) is connected thereto.
10. The adapter of claim 1 wherein said upper portion (66) includes a generally circular axial cross-section.
11. The adapter of claim 10 wherein said sealing portion (88) includes a generally circular axial cross-section sized and shaped to match said cross-section of said upper portion (66).
12. The adapter of claim 1 wherein said upper portion (66) includes a generally polygonal axial cross-section.
13. The adapter of claim 11 wherein said sealing portion (88) includes a generally polygonal axial cross-section sized and shaped to match said cross-section of said upper portion (66).
14. The adapter of claim 1 wherein said upper portion (66) includes a generally triangular axial cross-section.

tion, said upper portion (66) having three arcuate sides.

15. The adapter of claim 14 wherein said sealing portion (88) includes a generally triangular axial cross-section, said sealing portion (88) including three arcuate sides, said sealing portion (88) being sized and shaped to match said cross-section of said upper portion (66).

16. The adapter of claim 1 wherein said sealing portion (88) includes at least one circumferential ring (92) integrally molded thereon.

17. The adapter of claim 16 wherein said upper portion (66) includes at least one circumferential groove therein, said circumferential ring (92) being sized and shaped to sealably engage with said circumferential groove when said sealing portion (88) is received in said upper portion (66).

18. The adapter of claim 1 wherein the vacuum source is a piston pump (30) having a piston cylinder (32), and a piston (33), said piston (33) being disposed in said piston cylinder (32), said adapter (34) is in the form of a cylinder holder which is received on an output end of said piston cylinder (32), said piston pump (30) generating an intermittent vacuum through reciprocation of said piston (33) with an interior of said piston cylinder (32), said piston cylinder (32) having an end through which said piston (33) extends in use.

19. The adapter of claim 1 wherein said second end (84) of said male coupling component (50) is sized and shaped to be received in said lower portion (67) and in the breast shield (26).

20. The adapter of claim 1 for connecting the vacuum source (30) to the breast shield (26) with intermittent vacuum thereby being generated in said breast shield (26) to effect expression of milk from a breast, wherein said sealing portion (88) has at least one circumferential ring (92) integrally molded thereon and wherein the adapter (34) comprises a stopper (96A, 96B), said stopper being sized and shaped to be received in said upper portion (66) of said female coupling component (42) such that said stopper (96A, 96B) is in a substantially airtight engagement with said interior sidewall surface (68).

21. The adapter of claim 20 wherein two female coupling components (42) are provided thereon for receiving a respective male coupling component (50), and further including the stopper (96A, 96B), said stopper being sized and shaped to sealably engage said upper portion of either of said two female coupling components (42),

wherein said stopper (96A, 96B) includes an aperture (104, 106) formed therein such that when said stopper (96A, 96B) is engaged with said female coupling component (42), said aperture (104, 106) extends between ambient atmosphere and said female coupling component (42), and wherein said aperture (104, 106) is adapted to regulate vacuum pressure when only a single coupling component is in use, such that the vacuum generated is essentially the same for a given piston stroke whether on or both coupling components are being used.

22. A breast pump assembly with an adapter according to one of claims 1 to 21, wherein the assembly further comprises a vacuum source (30), a tube (44) and one or more milking units (22) including a breast shield (26) which is adapted to receive a woman's breast therein for expression of milk, a container (28) for expressed milk which is in fluid communication with said breast shield (26), and a tube attaching means for attaching said tube (44), thereto, said tube attaching means being in communication with said breast shield (26).

23. The breast pump assembly of claim 22 wherein said channel (76) is formed axially along said lower portion (67).

24. The breast pump assembly of claim 22 wherein said one or more female coupling component (42) is further defined by a bottom surface (72) of said housing (36).

25. The breast pump assembly of claim 24 wherein said bottom surface (72) includes one or more grooves (80) radially formed therein communicating with said one or more channels (76).

26. The breast pump assembly of claim 25 wherein said lower portion (67) includes three channels (76) formed axially in said lower portion (67) of said interior sidewall surface (68), said channels (76) being evenly spaced about the periphery of said lower portion (67) of said interior sidewall surface (68), and said bottom surface (72) includes three grooves (80) formed radially therein, said grooves (80) in said bottom surface (72) being in respective communication with said channels (76) in said lower portion (67) of said interior sidewall surface (68).

27. The breast pump assembly of claim 22 wherein two female coupling components (42) are provided on said adapter (34), and two male coupling components (50) are provided to be received in said female coupling components (42), and further comprising a stopper (96A, 96B), said stopper (96A, 96B) being sized and shaped to sealably engage said upper por-

tion (66) of either of said two coupling components (42).

28. The breast pump assembly of claim 27 wherein said stopper (96A, 96B) has an aperture (104, 106) formed therein such that when said stopper (96A, 96B) is engaged with said female coupling component (42), said aperture (104, 106) extends between ambient atmosphere and said female coupling component (42), said aperture (104, 106) being adapted to regulate vacuum pressure when only a single coupling component is in use, such that the vacuum generated is essentially equal for a given piston stroke whether one or both of said coupling components are being used.
29. The breast pump assembly of claim 22 wherein said upper portion (66) includes a generally circular axial cross-section.
30. The breast pump assembly of claim 29 wherein said sealing portion (88) includes a generally circular axial cross-section sized and shaped to match said cross-section of said upper portion (66).
31. The breast pump assembly of claim 22 wherein said upper portion (66) includes a generally polygonal axial cross-section.
32. The breast pump assembly of claim 31 wherein said sealing portion (88) includes a generally polygonal axial cross-section sized and shaped to match said cross-section of said upper portion (66).
33. The breast pump assembly of claim 22 wherein said upper portion (66) includes a generally triangular axial cross-section, said upper portion having three arcuate sides.
34. The breast pump assembly of claim 33 wherein said sealing portion (88) includes a generally triangular axial cross-section, said sealing portion having three arcuate sides, said scaling portion being sized and shaped to match said cross-section of said upper portion (66).
35. The breast pump assembly of claim 22 wherein said sealing portion (88) includes at least one circumferential ring (92) integrally molded thereon.
36. The breast pump assembly of claim 35 wherein said upper portion (66) includes at least one circumferential groove therein, said circumferential ring (92) being sized and shaped to sealably engage with said circumferential groove when said sealing portion is received in said upper portion.
37. The breast pump assembly of claim 22 wherein said

source of intermittent vacuum is a piston pump (30), said piston pump (30) having a piston cylinder (32) and a piston (33), said piston (33) being disposed in said piston cylinder (32), said adapter (34) sized and shaped as a cylinder holder which is received on an output end of said piston cylinder (32), said piston pump (30) generating an intermittent vacuum through reciprocation of said piston (33) with an interior of said piston cylinder (32), said piston cylinder (32) having an end through which said piston (33) extends in use.

38. The breast pump assembly of claim 22 wherein said second end (84) of said male coupling component (50) is sized and shaped to be received in said lower portion (67), and on said tube attaching means.

Patentansprüche

1. Adapter (34) zum Verbinden einer Vakuumquelle (30) mit einer Brusthaube (26) mit Schlauchmaterial (44) aufweisend: ein Gehäuse (46), welches an die Vakuumquelle (30) anschliessbar ist und eine innere Kammer (52) umfasst, die in mit der Vakuumquelle (30) kommuniziert; eine oder mehrere weibliche Kopplungskomponenten (42), wobei jede dieser einen oder mehreren weiblichen Kopplungskomponenten (42) durch eine innere Seitenwandoberfläche (68) des Gehäuses (46) definiert ist, wobei die innere Seitenwandoberfläche einen oberen Bereich (66) umfasst mit einem ersten Seitenwanddurchmesser (D1) und einen unteren Bereich (67) umfasst mit einem zweiten Seitenwanddurchmesser (D2) sowie einen Randbereich (74) zwischen diesem oberen Bereich (66) und diesem unteren Bereich (67) umfasst, der den oberen Bereich (66) und den unteren Bereich (67) miteinander verbindet, wobei der zweite Seitenwanddurchmesser (D2) kleiner als der erste Seitenwanddurchmesser (D1) ist, wobei der untere Bereich (67) einen oder mehrere darin ausgestaltete Anschlüsse (54) umfasst, welche eine Kommunikation der weiblichen Kopplungskomponente (42) mit der inneren Kammer (52) ermöglichen, sowie einen oder mehrere darin ausgestaltete Kanäle (76) umfasst, welche mit einer Öffnung (78) im Randbereich (74) kommunizieren, und einen oder mehrere männliche Kopplungskomponenten (50), wobei jede dieser einen oder mehreren männlichen Kopplungskomponenten (50) ein erstes Ende (62), ein zweites Ende (84) und einen Durchgang (86), welcher sich zwischen dem ersten Ende (82) und dem zweiten Ende (84) erstreckt, umfasst, wobei das erste Ende (82) derart bemessen und geformt ist, dass es am Schlauchmaterial (44) anschliessbar ist, wobei das zweite Ende (84) bemessen und geformt ist, um in dem einen oder den meh-

- rerer weiblichen Kopplungskomponenten (42) aufgenommen zu werden, und einen ersten Enddurchmesser aufweist, wobei jede der einen oder der mehreren männlichen Kopplungskomponenten (50) ausserdem einen Abdichtbereich (88) zwischen dem ersten Ende (82) und dem zweiten Ende (84) umfasst, wobei dieser Abdichtbereich (88) eine um die Peripherie herum ausgestaltete Dichtfläche (90) aufweist, wobei dieser Abdichtbereich (88) einen zweiten Enddurchmesser aufweist, der grösser ist als der erste Enddurchmesser, wobei der Abdichtbereich (88) bemessen und geformt ist, um im oberen Bereich (66) der weiblichen Kopplungskomponente (42) derart aufgenommen zu werden, dass die Verbindungsdichtfläche (90) im Wesentlichen in einer luftdichten Verbindung mit der inneren Seitenwandoberfläche (68) steht.
2. Adapter gemäss Anspruch 1, wobei der Kanal (76) axial entlang dem unteren Bereich (67) ausgebildet ist.
 3. Adapter gemäss Anspruch 1, wobei die eine oder die mehreren weiblichen Kopplungskomponenten (42) ausserdem durch eine Bodenoberfläche (72) des Gehäuses (36) definiert sind.
 4. Adapter gemäss Anspruch 3, wobei die Bodenoberfläche (72) eine oder mehrere darin ausgebildete Nuten (80) umfasst, welche mit dem einen oder den mehreren Kanälen (76) kommunizieren.
 5. Adapter gemäss Anspruch 3, wobei der untere Bereich (67) drei von den einen oder mehreren Kanälen (76) umfasst, welche axial im unteren Bereich (67) der inneren Seitenwandoberfläche (78) ausgebildet sind, wobei die drei Kanäle (76) in gleichmässigen Abständen um die Peripherie des unteren Bereiches (67) der inneren Oberfläche (68) herum angeordnet sind, und wobei die Bodenoberfläche (72) drei radial darin ausgebildete Nuten (80) umfasst, welche in der Bodenoberfläche (72) in entsprechender Kommunikation mit dem einen oder den mehreren Kanälen (76) im unteren Bereich (67) der inneren Seitenwandoberfläche (68) stehen.
 6. Adapter gemäss Anspruch 1, wobei zwei der einen oder der mehreren weiblichen Kopplungskomponenten (42) an diesem vorgesehen sind, und zwei der einen oder der mehreren männlichen Kopplungskomponenten (50) vorgesehen sind, um in den weiblichen Kopplungskomponenten (42) aufgenommen zu werden, und wobei ausserdem ein Stopper (96A, 96B) vorhanden ist, welcher bemessen und geformt ist, um den oberen Bereich (66) von einer der zwei weiblichen Kopplungskomponenten (42) dichtend zu verbinden.
 7. Adapter gemäss Anspruch 6, wobei der Stopper (96A, 96B) ein Loch (104, 106) umfasst, welches derart darin ausgebildet ist, dass sich das Loch (104, 106) zwischen Umgebungsatmosphäre und der weiblichen Kopplungskomponente (42) erstreckt, wenn der Stopper (96A, 96B) mit der weiblichen Kopplungskomponente (42) verbunden ist.
 8. Adapter gemäss Anspruch 7, wobei das Loch (104, 106) entlang einer Aussenwand eines Stopfenbereiches des Stoppers (96A, 96B) ausgebildet ist.
 9. Adapter gemäss Anspruch 7, wobei das Loch (104, 106) durch den Stopper (96A, 96B) hindurch ausgebildet ist, um einen Luftdurchlass zwischen Umgebungsatmosphäre und der weiblichen Kopplungskomponente (42) zu erlauben, wenn der Stopper (96A, 96B) mit dieser verbunden ist.
 10. Adapter gemäss Anspruch 1, wobei der obere Bereich einen hauptsächlich kreisförmigen, axialen Querschnitt umfasst.
 11. Adapter gemäss Anspruch 10, wobei der Abdichtbereich (88) einen hauptsächlich kreisförmigen, axialen Querschnitt aufweist, welcher derart bemessen und geformt ist, dass er dem Querschnitt des oberen Bereiches (66) entspricht.
 12. Adapter gemäss Anspruch 1, wobei der obere Bereich (66) einen hauptsächlich polygonalen, axialen Querschnitt umfasst.
 13. Adapter gemäss Anspruch 11, wobei der Abdichtbereich (88) einen hauptsächlich polygonalen, axialen Querschnitt umfasst, welcher derart bemessen und geformt ist, dass er dem Querschnitt des oberen Bereiches (66) entspricht.
 14. Adapter gemäss Anspruch 1, wobei der obere Bereich (66) einen hauptsächlich dreieckigen, axialen Querschnitt umfasst, wobei der obere Bereich (66) drei gebogene Seiten aufweist.
 15. Adapter gemäss Anspruch 14, wobei der Abdichtbereich (88) einen hauptsächlich dreieckigen, axialen Querschnitt umfasst, wobei der Abdichtbereich (88) drei gebogene Seiten umfasst, und wobei der Abdichtbereich (88) derart bemessen und geformt ist, dass er dem Querschnitt des oberen Bereiches (66) entspricht.
 16. Adapter gemäss Anspruch 1, wobei der Abdichtbereich (88) zumindest einen umlaufenden Ring (92) umfasst, welcher einstückig daran ausgeformt ist.
 17. Adapter gemäss Anspruch 16, wobei der obere Bereich (66) zumindest eine umlaufende, darin ausge-

bildete Nut umfasst, und wobei der umlaufende Ring (92) bemessen und geformt ist, um dichtend mit der umlaufenden Nut verbunden zu sein, wenn der Abdichtbereich (88) im oberen Bereich (66) aufgenommen ist.

18. Adapter gemäß Anspruch 1, wobei die Vakuumquelle eine Kolbenpumpe (30) ist mit einem Kolbenzylinder (32), und einem Kolben (33), welcher im Kolbenzylinder (32) angeordnet ist, wobei der Adapter (34) als ein Zylinderhalter ausgestaltet ist, welcher an einem Ausgangsende des Kolbenzylinders (32) aufgenommen ist, wobei die Kolbenpumpe (30) mittels Hinundherbewegung des Kolbens (33) im Inneren des Kolbenzylinders (32) ein intermittierendes Vakuum generiert, und wobei der Kolbenzylinder (32) ein Ende aufweist, durch welches sich der Kolben (33) bei Gebrauch hindurch erstreckt.
19. Adapter gemäß Anspruch 1, wobei das zweite Ende (84) der männlichen Kopplungskomponente (50) bemessen und geformt ist, um im unteren Bereich (67) und in der Brusthaube (26) aufgenommen zu werden.
20. Adapter gemäß Anspruch 1 zum Verbinden der Vakuumquelle (30) mit der Brusthaube (26), wobei ein intermittierendes Vakuum dabei in der Brusthaube (26) generiert wird, um Milch aus einer Brust zu exprimieren, wobei der Abdichtbereich (88) zumindest einen umlaufenden Ring (92) aufweist, welcher einstückig daran ausgeformt ist, und wobei der Adapter (34) einen Stopper (96A, 96B) aufweist, welcher bemessen und geformt ist, um im oberen Bereich (66) der weiblichen Kopplungskomponente (42) aufgenommen zu werden, so dass der Stopper (96A, 96B) in einer im Wesentlichen luftdichten Verbindung mit der inneren Seitenwandoberfläche (68) steht.
21. Adapter gemäß Anspruch 20, wobei zwei weibliche Kopplungskomponenten (42) an diesem vorgesehen sind, um eine entsprechende männliche Kopplungskomponente (50) aufzunehmen, wobei ausserdem der Stopper (96A, 96B) vorhanden ist, welcher bemessen und geformt ist, um den oberen Bereich von einer der zwei weiblichen Kopplungskomponenten (42) dichtend zu verbinden, wobei der Stopper (96A, 96B) ein Loch (104, 106) umfasst, welches darin derart ausgestaltet ist, dass sich das Loch (104, 106) zwischen Umgebungsatmosphäre und der weiblichen Kopplungskomponente (42) erstreckt, wenn der Stopper (96A, 96B) mit der weiblichen Kopplungskomponente (42) verbunden ist, und wobei das Loch (104, 106) dazu ausgebildet ist, einen Vakuumdruck zu regulieren, wenn nur eine einzige Kopplungskomponente in Gebrauch ist, so dass das generierte Vakuum für einen gegebenen Kol-

benhub im Wesentlichen dasselbe ist, unabhängig davon, ob eine oder zwei Kopplungskomponenten benutzt werden.

22. Brustpumpenvorrichtung mit einem Adapter gemäß einem der Ansprüche 1 bis 21, wobei die Vorrichtung ausserdem eine Vakuumquelle (30) aufweist, einen Schlauch (44) und eine oder mehrere Milcheinheiten (22), welche eine Brusthaube (26) umfassen, die zur Aufnahme der Brust einer Mutter zum Exprimieren von Milch geeignet ist, einen Behälter (28) für exprimierte Milch, welcher in Fluidkommunikation mit der Brusthaube (26) steht, und ein Schlauchanschlussmittel, welches in Kommunikation mit der Brusthaube (26) steht, um den Schlauch (44) daran zu anschliessen,.
23. Brustpumpenvorrichtung gemäß Anspruch 22, wobei der Kanal (76) axial entlang dem unteren Bereich (67) ausgestaltet ist.
24. Brustpumpenvorrichtung gemäß Anspruch 22, wobei eine oder mehrere weibliche Kopplungskomponenten (42) ausserdem durch eine Bodenoberfläche (72) des Gehäuses (36) definiert sind.
25. Brustpumpenvorrichtung gemäß Anspruch 24, wobei die Bodenoberfläche (72) eine oder mehrere radial darin ausgestaltete Nuten (80) umfasst, welche mit dem einen oder den mehreren Kanälen (76) kommunizieren.
26. Brustpumpenvorrichtung gemäß Anspruch 25, wobei der untere Bereich (67) drei Kanäle (76) umfasst, welche axial im unteren Bereich (67) der inneren Seitenwandoberfläche (68) ausgestaltet sind, wobei die Kanäle (76) in gleichmässigen Abständen um die Peripherie des unteren Bereiches (67) der inneren Seitenwandoberfläche (68) herum angeordnet sind, und wobei die Bodenoberfläche (72) drei radial darin ausgestaltete Nuten (80) umfasst, welche in entsprechender Kommunikation mit den Kanälen (76) im unteren Bereich (67) der inneren Seitenwandoberfläche (68) stehen.
27. Brustpumpenvorrichtung gemäß Anspruch 22, wobei zwei weibliche Kopplungskomponenten (42) am Adapter (34) vorgesehen sind, und wobei zwei männliche Kopplungskomponenten (50) vorgesehen sind, um in den weiblichen Kopplungskomponenten (42) aufgenommen zu werden, und ausserdem aufweisend ein Stopper (96A, 96B), welcher derart bemessen und geformt ist, dass er den oberen Bereich (66) von einer der zwei Kopplungskomponenten (42) dichtend verbindet.
28. Brustpumpenvorrichtung gemäß Anspruch 27, wobei der Stopper (96A, 96B) ein Loch (104, 106) auf-

weist, welches derart darin ausgestaltet ist, dass sich das Loch (104, 106) zwischen Umgebungsatmosphäre und der weiblichen Kopplungskomponente (42) erstreckt, wenn der Stopper (96A, 96B) mit der weiblichen Kopplungskomponente (42) verbunden ist, wobei das Loch (104, 106) dazu ausgebildet ist, einen Vakuumdruck zu regulieren, wenn nur eine einzige Kopplungskomponente in Gebrauch ist, so dass das generierte Vakuum für einen gegebenen Kolbenhub im Wesentlichen dasselbe ist, unabhängig davon, ob eine oder beide der Kopplungskomponenten benutzt werden.

29. Brustpumpenvorrichtung gemäß Anspruch 22, wobei der obere Bereich (66) einen im Wesentlichen kreisförmigen, axialen Querschnitt umfasst.

30. Brustpumpenvorrichtung gemäß Anspruch 29, wobei der Abdichtbereich (88) einen im Wesentlichen kreisförmigen, axialen Querschnitt umfasst, welcher derart bemessen und geformt ist, dass er dem Querschnitt des oberen Bereiches (66) entspricht.

31. Brustpumpenvorrichtung gemäß Anspruch 22, wobei der obere Bereich (66) einen im Wesentlichen polygonalen, axialen Querschnitt umfasst.

32. Brustpumpenvorrichtung gemäß Anspruch 31, wobei der Abdichtbereich (88) einen im Wesentlichen polygonalen, axialen Querschnitt umfasst, welcher derart bemessen und geformt ist, dass er dem Querschnitt des oberen Bereiches (66) entspricht.

33. Brustpumpenvorrichtung gemäß Anspruch 22, wobei der obere Bereich (66) einen im Wesentlichen dreieckigen, axialen Querschnitt umfasst, und wobei der obere Bereich drei gebogene Seiten aufweist.

34. Brustpumpenvorrichtung gemäß Anspruch 33, wobei der Abdichtbereich (88) einen im Wesentlichen dreieckigen, axialen Querschnitt umfasst und drei gebogene Seiten aufweist, und wobei der Abdichtbereich derart bemessen und geformt ist, dass der dem Querschnitt des oberen Bereiches (66) entspricht.

35. Brustpumpenvorrichtung gemäß Anspruch 22, wobei der Abdichtbereich (88) zumindest einen umlaufenden Ring (92) umfasst, welcher einstückig daran angeformt ist.

36. Brustpumpenvorrichtung gemäß Anspruch 35, wobei der obere Bereich (66) zumindest eine umlaufende Nut umfasst, und wobei der umlaufende Ring (92) derart bemessen und geformt ist, dass er eine dichtende Verbindung mit der umlaufenden Nut eingeht, wenn der Abdichtbereich im oberen Bereich aufgenommen ist.

37. Brustpumpenvorrichtung gemäß Anspruch 22, wobei die Quelle des intermittierenden Vakuums eine Kolbenpumpe (30) ist, welche einen Kolbenzylinder (32) und einen Kolben (33) aufweist, wobei der Kolben (33) im Kolbenzylinder (32) angeordnet ist, wobei der Adapter (34) als ein Zylinderhalter bemessen und geformt ist, welcher in einem Ausgangsende des Kolbenzylinders (32) aufgenommen ist, wobei die Kolbenpumpe (30) mittels Hinundherbewegung des Kolbens (33) im Inneren des Kolbenzylinders (32) ein intermittierendes Vakuum generiert, und wobei der Kolbenzylinder (32) ein Ende aufweist, durch welches sich der Kolben (33) bei Gebrauch hindurch erstreckt.

38. Brustpumpenvorrichtung gemäß Anspruch 22, wobei das zweite Ende (84) der männlichen Kopplungskomponente (50) bemessen und geformt ist, um im unteren Bereich (67) und am Schlauchanschlussmittel aufgenommen zu werden.

Revendications

1. Adaptateur (34) pour connecter une source de vide (30) à une tétérèlle (26) avec un tuyau (44), comprenant : un boîtier (46) pouvant être attaché à la source de vide (30) et comportant une chambre interne (52) communiquant avec la source de vide (30) ;
un ou plusieurs composants de connecteur femelles (42), chacun desdits un ou plusieurs composants de connecteur femelles (42) étant défini par une surface de paroi latérale intérieure (68) ou par ledit boîtier (46), ladite surface de paroi latérale intérieure comportant une portion supérieure (66) avec un premier diamètre de paroi latérale (D1) et une portion inférieure (67) avec un deuxième diamètre de paroi latérale (D2), et une portion de bord (74) entre ladite portion supérieure (66) et ladite portion inférieure (67), connectant ladite portion supérieure (66) et ladite portion inférieure (67), ledit deuxième diamètre de paroi latérale (D2) étant plus petit que ledit premier diamètre de paroi latérale (D1), ladite portion inférieure (67) comportant un ou plusieurs orifices (54) formés dans celle-ci, permettant la communication dudit composant de connecteur femelle (42) avec ladite chambre interne (52), et un ou plusieurs canaux (76) formés dans celle-ci, communiquant avec une ouverture (78) dans ladite portion de bord (74), et
un ou plusieurs composants de connecteur mâles (50), chacun desdits un ou plusieurs composants de connecteur mâles (50) comportant une première extrémité (82), une deuxième extrémité (84) et un passage (86) s'étendant entre ladite première extrémité (82) et ladite deuxième extrémité (84), ladite première extrémité (82) étant dimensionnée et formée pour

- être attachée au tuyau (44), ladite deuxième extrémité (84) étant dimensionnée et formée pour être reçue dans l'un desdits un ou plusieurs composants de connecteur femelles (42) et ayant un premier diamètre d'extrémité, chacun desdits un ou plusieurs composants de connecteur mâles (50) comportant en outre une portion d'étanchéité (88) entre ladite première extrémité (82) et ladite deuxième extrémité (84), ladite portion d'étanchéité (88) ayant une surface d'étanchéité (90) formée autour d'une périphérie de celle-ci, ladite portion d'étanchéité (88) ayant un deuxième diamètre d'extrémité, ledit deuxième diamètre d'extrémité étant supérieur audit premier diamètre d'extrémité, ladite portion d'étanchéité (88) étant dimensionnée et formée de manière à être reçue dans ladite portion supérieure (66) dudit composant de connecteur femelle (42), de telle sorte que ladite surface d'étanchéité de connecteur (90) est en engagement substantiellement étanche à l'air avec ladite surface de paroi latérale intérieure (68).
2. Adaptateur selon la revendication 1, dans lequel ledit canal (76) est formé axialement le long de ladite portion inférieure (67).
 3. Adaptateur selon la revendication 1, dans lequel lesdits un ou plusieurs composants de connecteur femelles (42) sont définis en outre par une surface inférieure (72) dudit boîtier (36).
 4. Adaptateur selon la revendication 3, dans lequel ladite surface inférieure (72) comporte une ou plusieurs gorges (80) formées dans celle-ci et communiquant avec lesdits un ou plusieurs canaux (76).
 5. Adaptateur selon la revendication 3, dans lequel ladite portion inférieure (67) comporte trois desdits un ou plusieurs canaux (76) formés axialement dans ladite portion inférieure (67) de ladite surface de paroi latérale intérieure (68), lesdits trois canaux (76) étant espacés uniformément autour de ladite périphérie de ladite portion inférieure (67) de ladite surface intérieure (68), et ladite surface inférieure (72) comportant trois gorges (80) formées radialement dans celle-ci, lesdites gorges (80) dans ladite surface inférieure (72) étant en communication respective avec lesdits un ou plusieurs canaux (76) dans ladite portion inférieure (67) de ladite surface de paroi latérale intérieure (68).
 6. Adaptateur selon la revendication 1, dans lequel deux desdits un ou plusieurs composants de connecteur femelles (42) sont prévus sur celui-ci, et deux desdits un ou plusieurs composants de connecteur mâles (50) sont prévus pour être reçus dans lesdits composants de connecteur femelles (42), et comportant en outre une butée (96A, 96B), ladite butée (96A, 96B) étant dimensionnée et formée de manière à s'engager hermétiquement avec ladite portion supérieure (66) de l'un ou l'autre desdits deux composants de connecteur femelles (42).
 7. Adaptateur selon la revendication 6, dans lequel ladite butée (96A, 96B) comporte une ouverture (104, 106) formée dans celle-ci, de telle sorte que, lorsque ladite butée (96A, 96B) est en prise avec ledit composant de connecteur femelle (42), ladite ouverture (104, 106) s'étende entre l'atmosphère ambiante et ledit composant de connecteur femelle (42).
 8. Adaptateur selon la revendication 7, dans lequel ladite ouverture (104, 106) est formée le long d'une paroi extérieure d'une portion de prise de ladite butée (96A, 96B).
 9. Adaptateur selon la revendication 7, dans lequel ladite ouverture (104, 106) est formée à travers ladite butée (96A, 96B) de manière à permettre une fuite d'air entre l'atmosphère ambiante et ledit composant de connecteur femelle (42) lorsque ladite butée (96A, 96B) est connectée à celui-ci.
 10. Adaptateur selon la revendication 1, dans lequel ladite portion supérieure comporte une section transversale axiale généralement circulaire.
 11. Adaptateur selon la revendication 10, dans lequel ladite portion d'étanchéité (88) comporte une section transversale axiale généralement circulaire dimensionnée et formée de manière à correspondre à ladite section transversale de ladite portion supérieure (66).
 12. Adaptateur selon la revendication 1, dans lequel ladite portion supérieure (66) comporte une section transversale axiale généralement polygonale.
 13. Adaptateur selon la revendication 11, dans lequel ladite portion d'étanchéité (88) comporte une section transversale axiale généralement polygonale dimensionnée et formée pour correspondre à ladite section transversale de ladite portion supérieure (66).
 14. Adaptateur selon la revendication 1, dans lequel ladite portion supérieure (66) comporte une section transversale axiale généralement triangulaire, ladite portion supérieure (66) ayant trois côtés courbés.
 15. Adaptateur selon la revendication 14, dans lequel ladite portion d'étanchéité (88) comporte une section transversale axiale généralement triangulaire, ladite portion d'étanchéité (88) comportant trois côtés courbés, ladite portion d'étanchéité (88) étant dimensionnée et formée pour correspondre à ladite section transversale de ladite portion supérieure

- (66).
16. Adaptateur selon la revendication 1, dans lequel ladite portion d'étanchéité (88) comporte au moins une bague circonférentielle (92) moulée intégralement sur celle-ci. 5
17. Adaptateur selon la revendication 16, dans lequel ladite portion supérieure (66) comporte au moins une gorge circonférentielle, ladite bague circonférentielle (92) étant dimensionnée et formée de manière à s'engager de manière hermétique avec ladite gorge circonférentielle lorsque ladite portion d'étanchéité (88) est reçue dans ladite portion supérieure (66). 10
18. Adaptateur selon la revendication 1, dans lequel la source de vide est une pompe à piston (30) ayant un cylindre de piston (32), et un piston (33), ledit piston (33) étant disposé dans ledit cylindre de piston (32), ledit adaptateur (34) étant sous forme d'un support de cylindre qui est reçu sur une extrémité de sortie dudit cylindre de piston (32), ladite pompe à piston (30) produisant un vide intermittent par mouvement alternatif dudit piston (33) dans l'intérieur dudit cylindre de piston (32), ledit cylindre de piston (32) ayant une extrémité à travers laquelle ledit piston (33) s'étend pendant l'utilisation. 20 25
19. Adaptateur selon la revendication 1, dans lequel ladite deuxième extrémité (84) dudit composant de connecteur mâle (50) est dimensionnée et formée de manière à être reçue dans ladite portion inférieure (67) et dans la tétérrelle (26). 30
20. Adaptateur selon la revendication 1, pour connecter la source de vide (30) à la tétérrelle (26) avec un vide intermittent généré par celle-ci dans ladite tétérrelle (26) pour provoquer l'expression de lait d'un sein, ladite portion d'étanchéité (88) ayant au moins une bague circonférentielle (92) moulée intégralement sur celle-ci et l'adaptateur (34) comprenant une butée (96A, 96B), ladite butée étant dimensionnée et formée de manière à être reçue dans ladite portion supérieure (66) dudit composant de connecteur femelle (42) de telle sorte que ladite butée (96A, 96B) soit en engagement substantiellement étanche à l'air avec ladite surface de paroi latérale intérieure (68). 35 40
21. Adaptateur selon la revendication 20, dans lequel deux composants de connecteur femelles (42) sont prévus sur celui-ci pour recevoir un composant de connecteur mâle respectif (50), et comportant en outre la butée (96A, 96B), ladite butée étant dimensionnée et formée de manière à s'engager de manière hermétique avec ladite portion supérieure de l'un ou l'autre desdits deux composants de connecteur femelles (42), ladite butée (96A, 96B) comprenant une ouverture (104, 106) formée dans celle-ci, de telle sorte que, lorsque ladite butée (96A, 96B) est en prise avec ledit composant de connecteur femelle (42), ladite ouverture (104, 106) s'étende entre l'atmosphère ambiante et ledit composant de connecteur femelle (42), et ladite ouverture (104, 106) étant prévue pour réguler la pression de vide lorsque seulement un composant de connecteur est utilisé, de telle sorte que le vide produit soit essentiellement le même pour une course de piston donnée, indépendamment du fait qu'un ou les deux composants de connecteur soient utilisés. 45 50
22. Ensemble de tire-lait comprenant un adaptateur selon l'une quelconque des revendications 1 à 21, dans lequel l'ensemble comprend en outre une source de vide (30), un tuyau (44) et une ou plusieurs unités de tire-lait (22) comportant une tétérrelle (26) qui est prévue pour recevoir le sein d'une femme en vue de tirer du lait, un contenant (28) pour le lait tiré, en communication fluide avec ladite tétérrelle (26), et un moyen de fixation de tuyau pour attacher ledit tuyau (44) à celle-ci, ledit moyen de fixation de tuyau étant en communication avec ladite tétérrelle (26). 55
23. Ensemble de tire-lait selon la revendication 22, dans lequel ledit canal (76) est formé axialement le long de ladite portion inférieure (67).
24. Ensemble de tire-lait selon la revendication 22, dans lequel lesdits un ou plusieurs composants de connecteur femelles (42) sont en outre définis par une surface inférieure (72) dudit boîtier (36).
25. Ensemble de tire-lait selon la revendication 24, dans lequel ladite surface inférieure (72) comporte une ou plusieurs gorges (80) formées radialement dans celle-ci et communiquant avec lesdits un ou plusieurs canaux (76).
26. Ensemble de tire-lait selon la revendication 25, dans lequel ladite portion inférieure (67) comporte trois canaux (76) formés axialement dans ladite portion inférieure (67) de ladite surface de paroi latérale intérieure (68), lesdits canaux (76) étant espacés uniformément autour de la périphérie de ladite portion inférieure (67) de ladite surface de paroi latérale intérieure (68), et ladite surface inférieure (72) comportant trois gorges (80) formées radialement dans celle-ci, lesdites gorges (80) dans ladite surface inférieure (72) étant en communication respective avec lesdits canaux (76) dans ladite portion inférieure (67) de ladite surface de paroi latérale intérieure (68). 55
27. Ensemble de tire-lait selon la revendication 22, dans lequel deux composants de connecteur femelles

- (42) sont prévus sur ledit adaptateur (34), et deux composants de connecteur mâles (50) sont prévus de manière à être reçus dans lesdits composants de connecteur femelles (42), et comprenant en outre une butée (96A, 96B), ladite butée (96A, 96B) étant dimensionnée et formée de manière à s'engager de manière hermétique avec ladite portion supérieure (66) de l'un ou l'autre desdits deux composants de connecteur (42).
28. Ensemble de tire-lait selon la revendication 27, dans lequel ladite butée (96A, 96B) a une ouverture (104, 106) formée dans celle-ci, de telle sorte que, lorsque ladite butée (96A, 96B) est en prise avec ledit composant de connecteur femelle (42), ladite ouverture (104, 106) s'étende entre l'atmosphère ambiante et ledit composant de connecteur femelle (42), ladite ouverture (104, 106) étant prévue pour réguler la pression de vide lorsque seulement un composant de connecteur est utilisé, de telle sorte que le vide généré soit essentiellement le même pour une course de piston donnée, indépendamment du fait qu'un desdits composants de connecteur ou les deux soient utilisés.
29. Ensemble de tire-lait selon la revendication 22, dans lequel ladite portion supérieure (66) comporte une section transversale axiale généralement circulaire.
30. Ensemble de tire-lait selon la revendication 29, dans lequel ladite portion d'étanchéité (88) comporte une section transversale axiale généralement circulaire dimensionnée et formée de manière à correspondre à ladite section transversale de ladite portion supérieure (66).
31. Ensemble de tire-lait selon la revendication 22, dans lequel ladite portion supérieure (66) comporte une section transversale axiale généralement polygonale.
32. Ensemble de tire-lait selon la revendication 31, dans lequel ladite portion d'étanchéité (88) comporte une section transversale axiale généralement polygonale dimensionnée et formée de manière à correspondre à ladite section transversale de ladite portion supérieure (66).
33. Ensemble de tire-lait selon la revendication 22, dans lequel ladite portion supérieure (66) comporte une section transversale axiale généralement triangulaire, ladite portion supérieure ayant trois côtés courbés.
34. Ensemble de tire-lait selon la revendication 33, dans lequel ladite portion d'étanchéité (88) comporte une section transversale axiale généralement triangulaire, ladite portion d'étanchéité ayant trois côtés courbés, ladite portion d'étanchéité étant dimensionnée et formée pour correspondre à ladite section transversale de ladite portion supérieure (66).
35. Ensemble de tire-lait selon la revendication 22, dans lequel ladite portion d'étanchéité (88) comporte au moins une bague circonférentielle (92) moulée intégralement sur celle-ci.
36. Ensemble de tire-lait selon la revendication 35, dans lequel ladite portion supérieure (66) comporte au moins une gorge circonférentielle, ladite bague circonférentielle (92) étant dimensionnée et formée pour s'engager de manière hermétique avec ladite gorge circonférentielle lorsque ladite portion d'étanchéité est reçue dans ladite portion supérieure.
37. Ensemble de tire-lait selon la revendication 22, dans lequel ladite source de vide intermittent est une pompe à piston (30), ladite pompe à piston (30) ayant un cylindre de piston (32) et un piston (33), ledit piston (33) étant disposé dans ledit cylindre de piston (32), ledit adaptateur (34) étant dimensionné et formé sous forme d'un support de cylindre, qui est reçu sur une extrémité de sortie dudit cylindre de piston (32), ladite pompe à piston (30) produisant un vide intermittent par mouvement alternatif dudit piston (33) dans l'intérieur dudit cylindre de piston (32), ledit cylindre de piston (32) ayant une extrémité à travers laquelle ledit piston (33) s'étend pendant l'utilisation.
38. Ensemble de tire-lait selon la revendication 22, dans lequel ladite deuxième extrémité (84) dudit composant de connecteur mâle (50) est dimensionnée et formée de manière à être reçue dans ladite portion inférieure (67), et sur ledit moyen de fixation de tuyau.

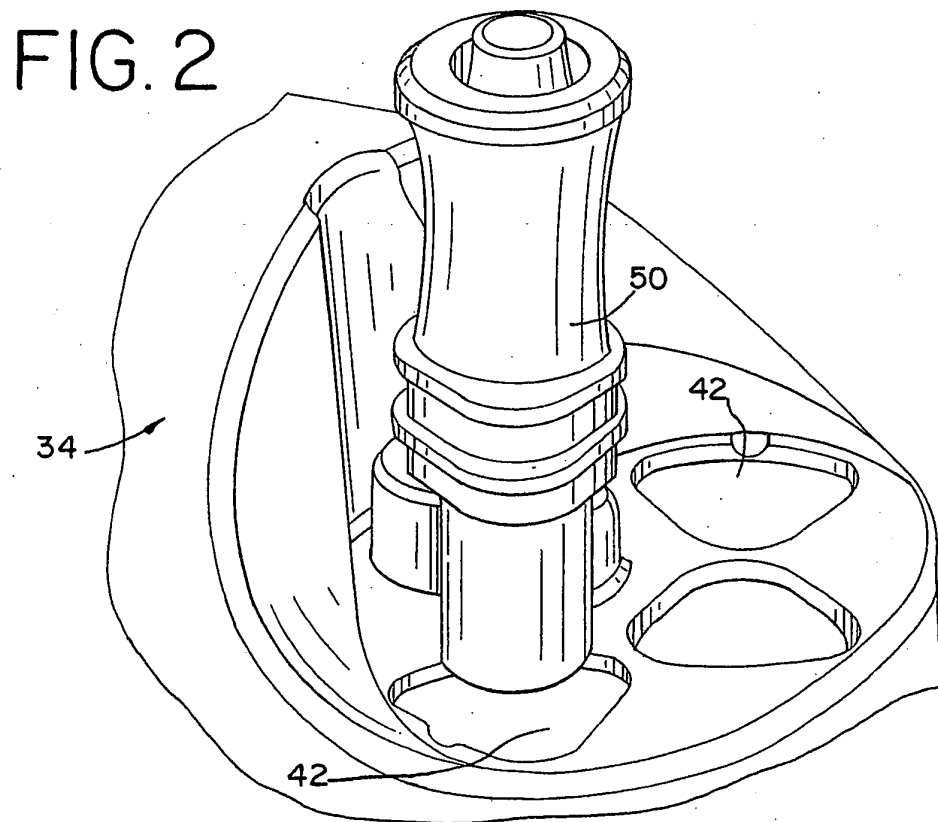
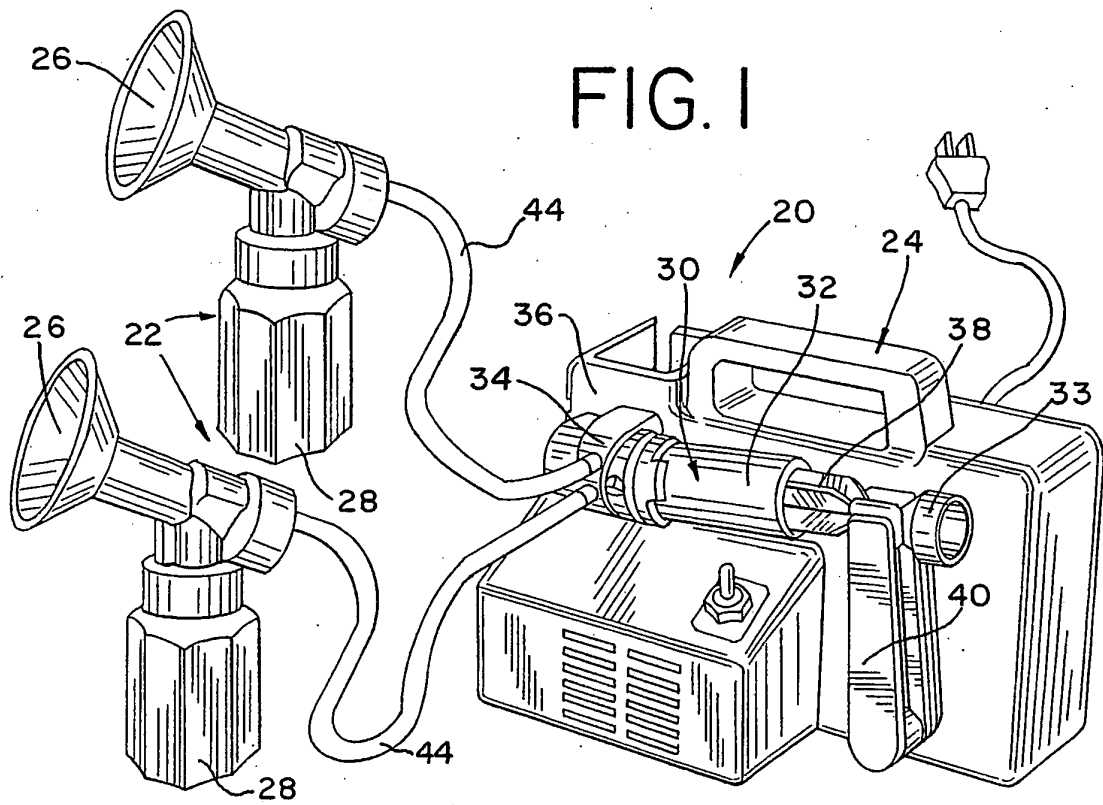


FIG.3A

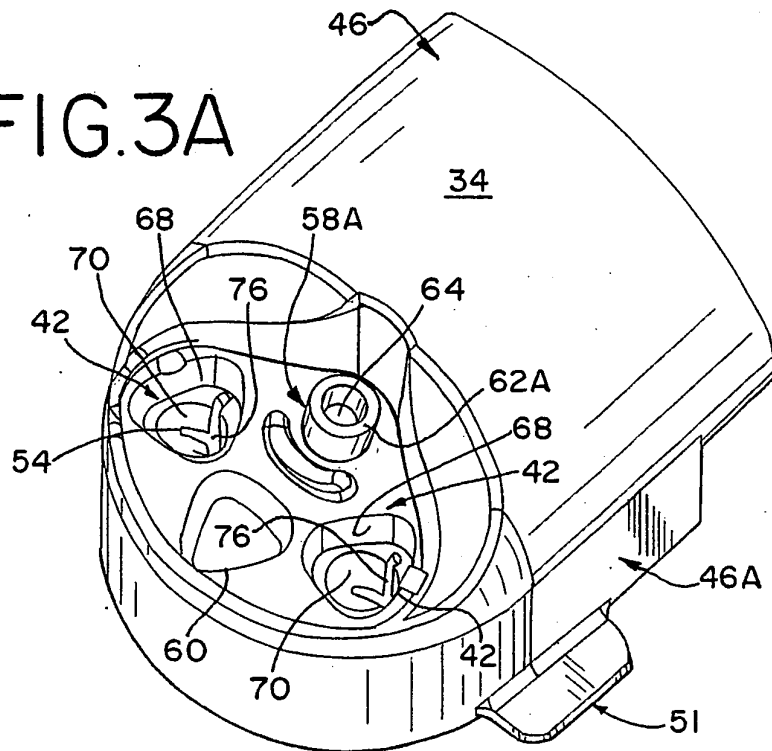


FIG.3B

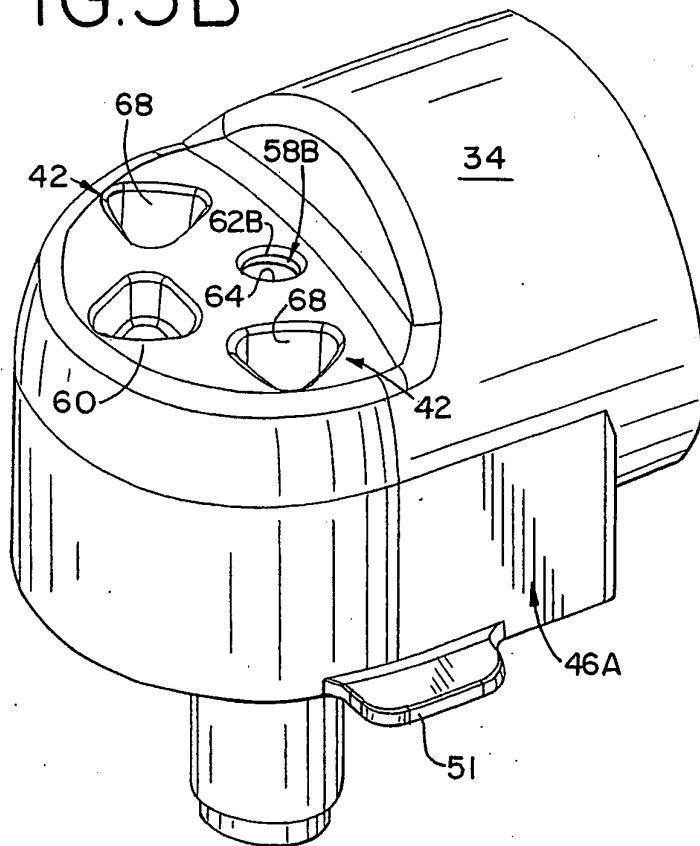


FIG. 4

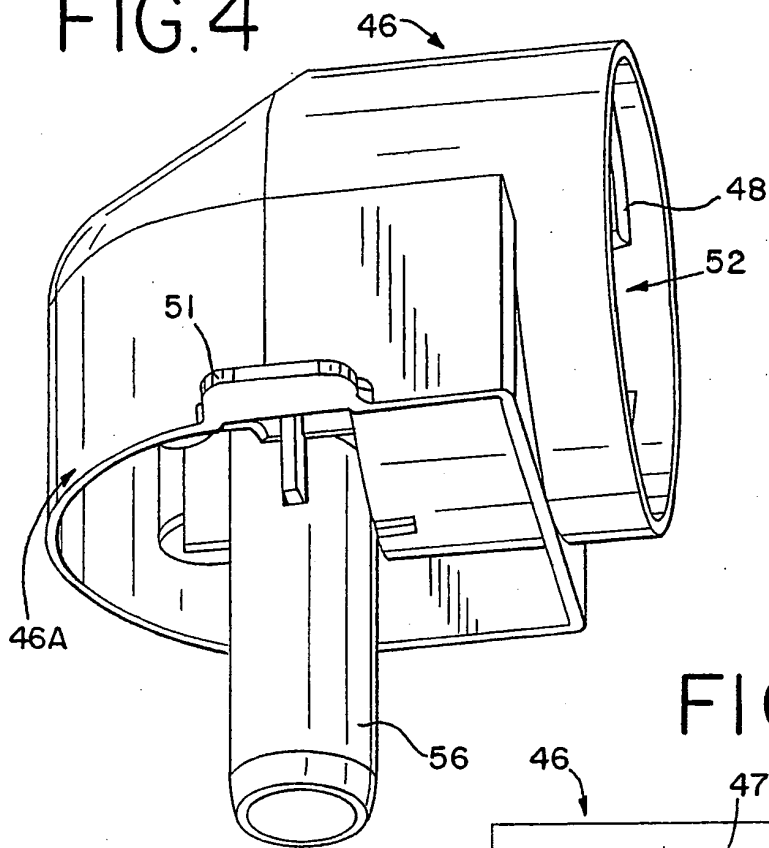


FIG. 5

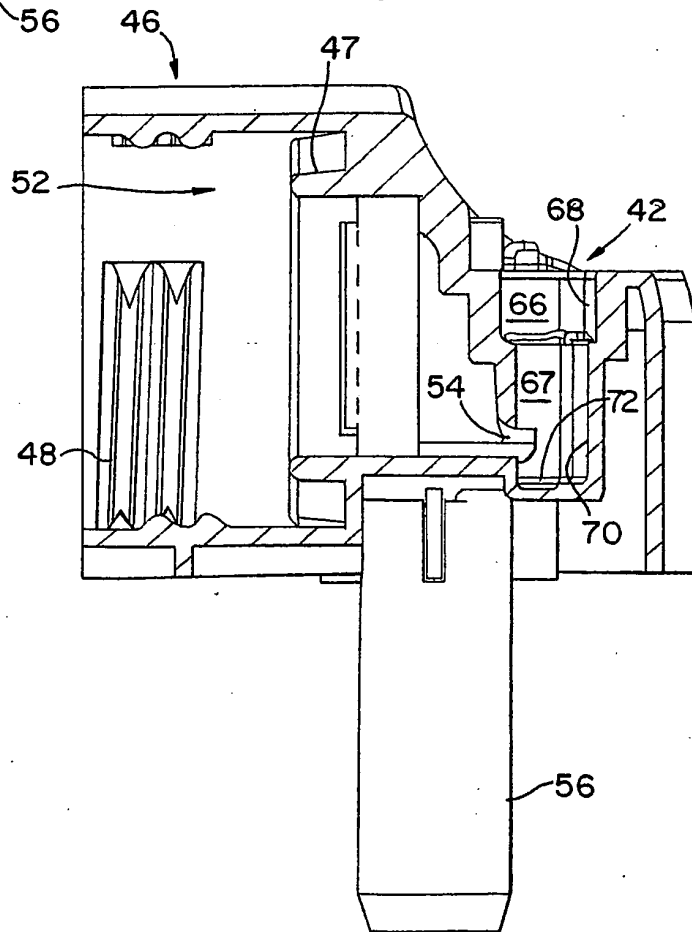


FIG.6A

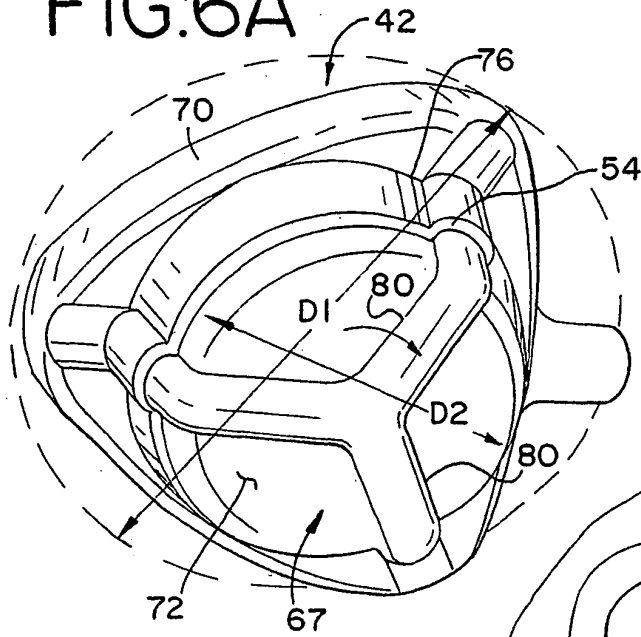


FIG.6B

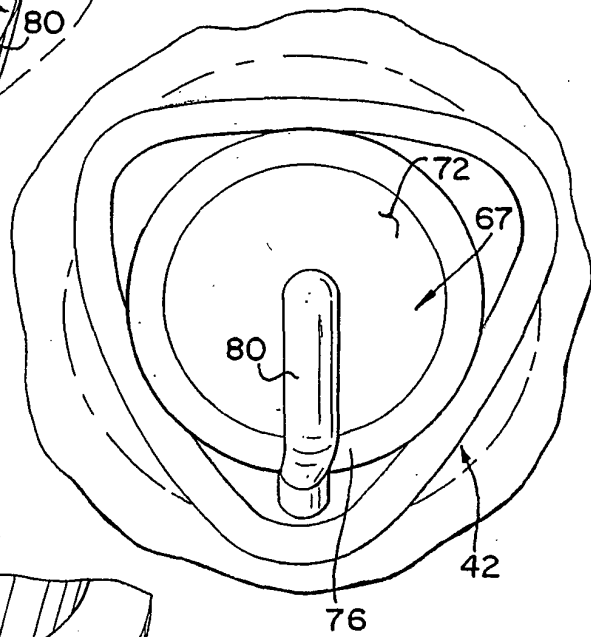


FIG.7

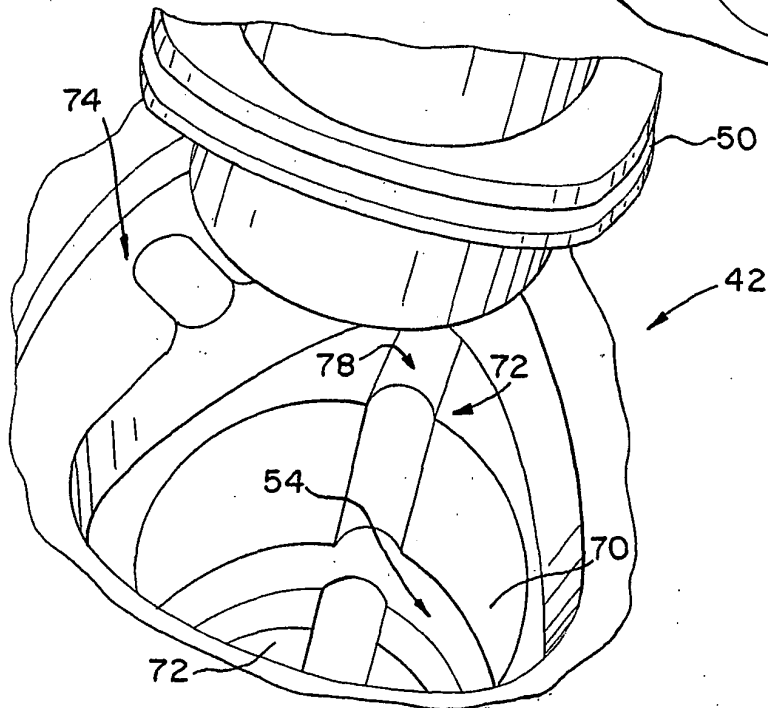


FIG.8

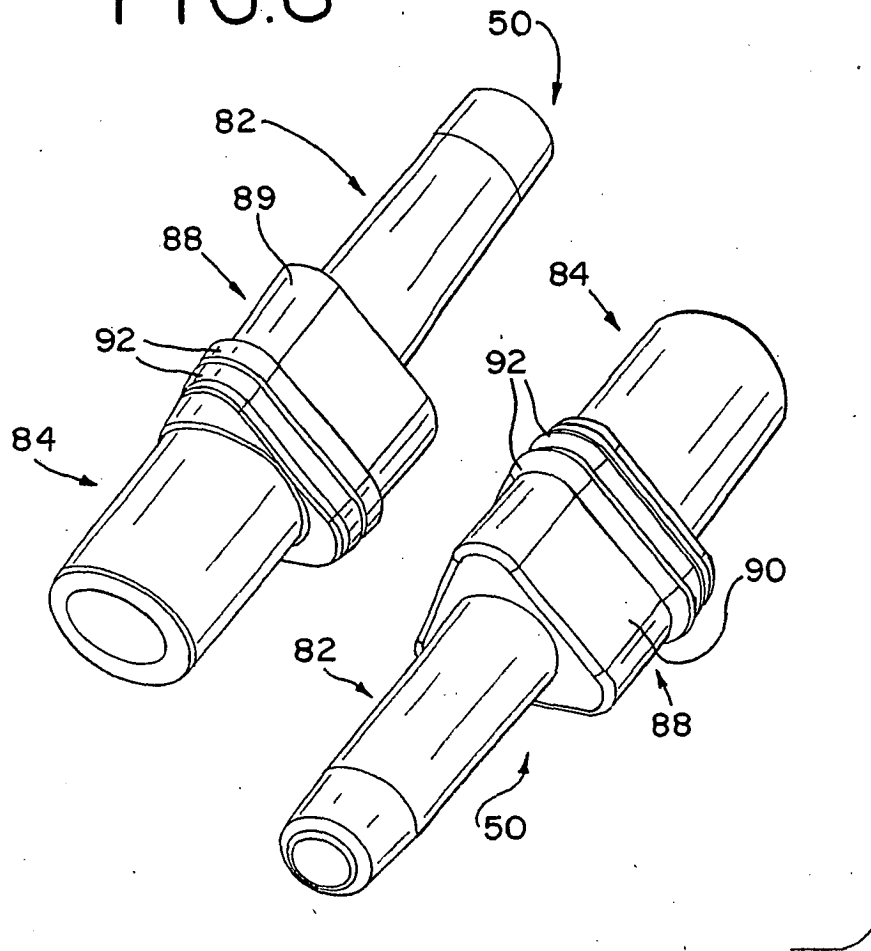


FIG.9

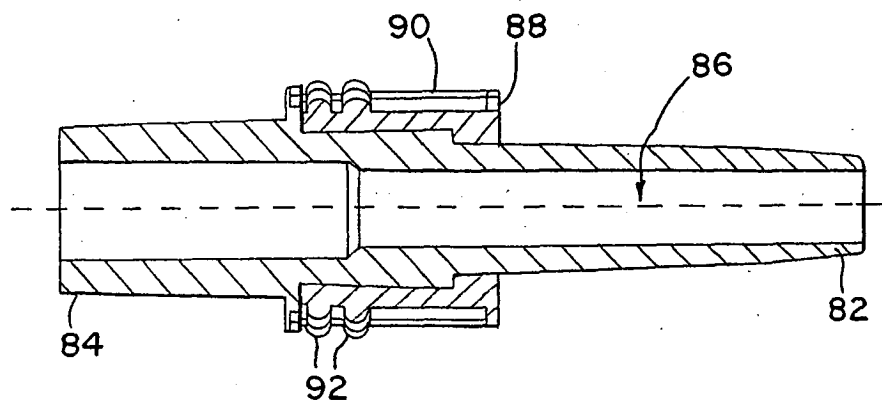


FIG. 10

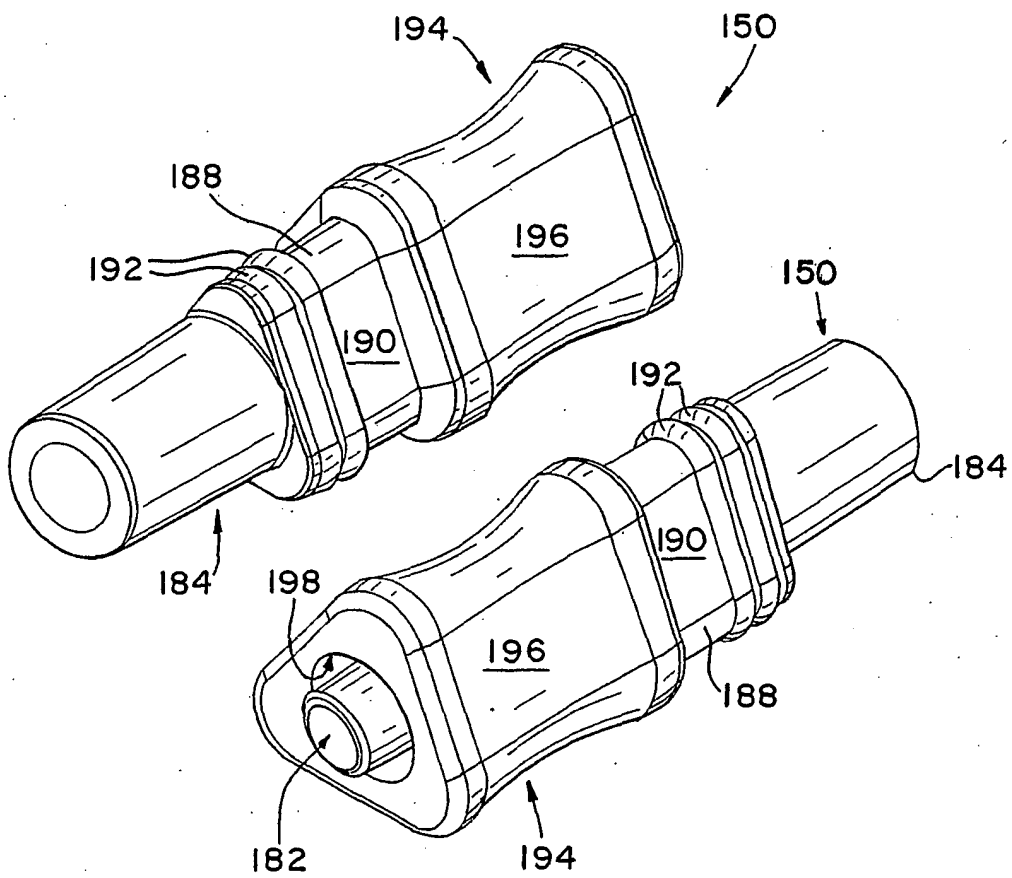


FIG. 11

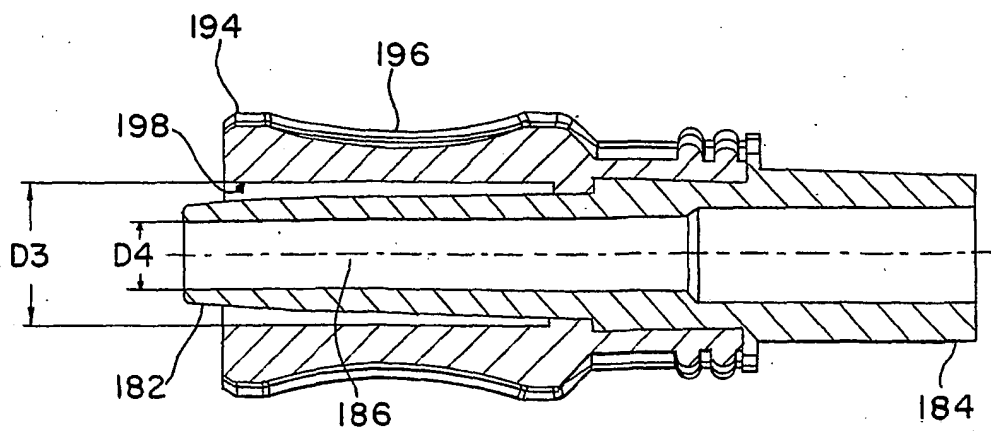


FIG.12

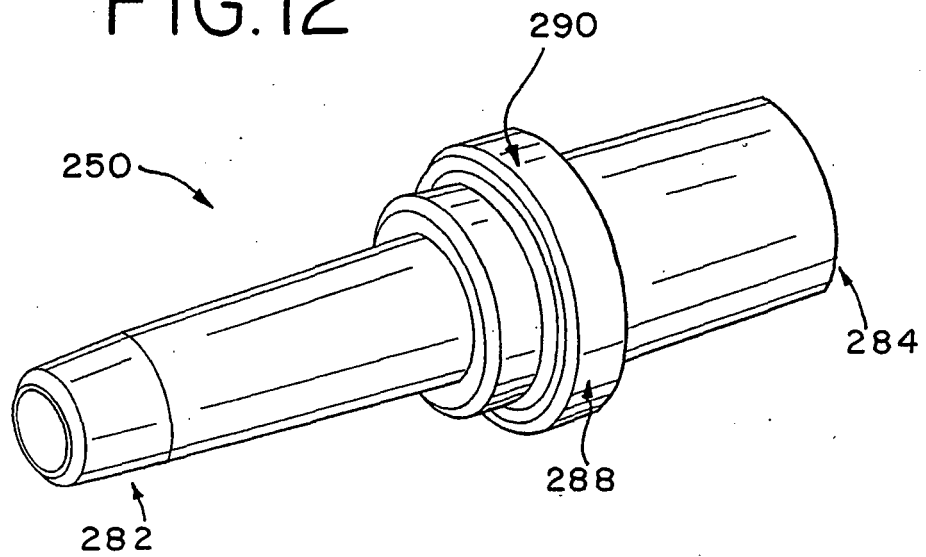


FIG.13

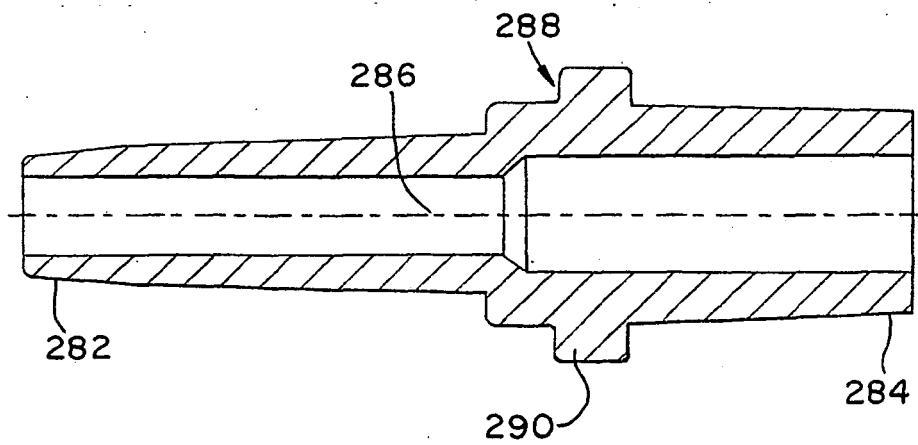


FIG. 14A

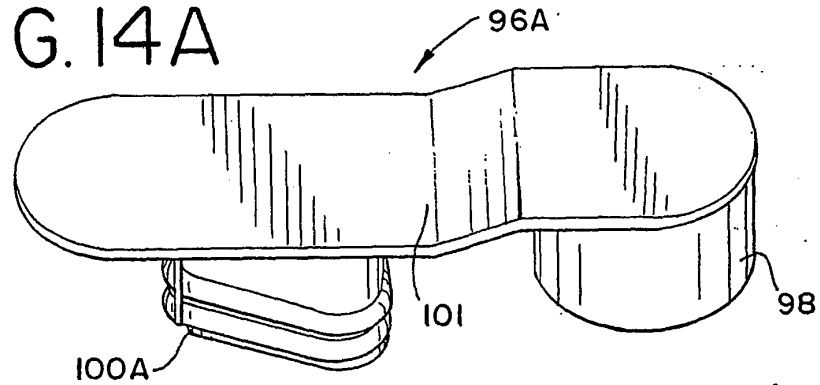


FIG. 14B

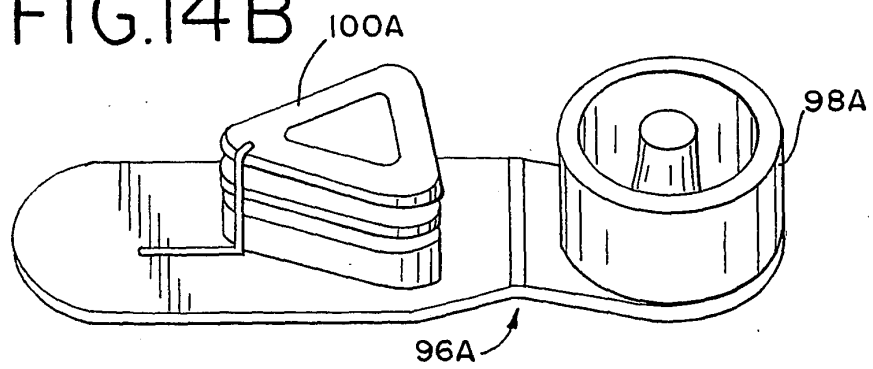


FIG. 14C

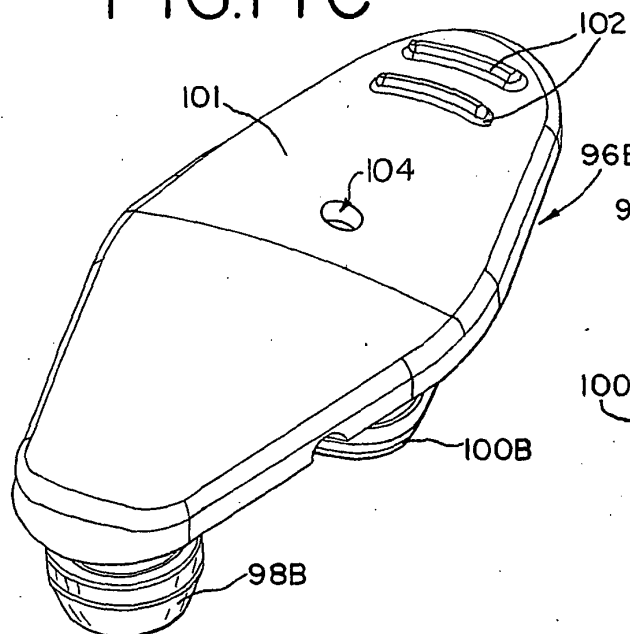
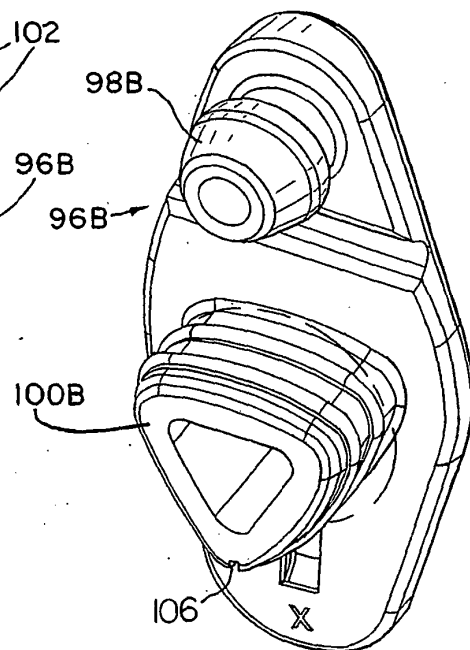


FIG. 14D



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